DECLARATION

I, Minjung Kwak, a Korean citizen of 8th Floor, Daelim Building 1600-3, Seocho-dong, Seocho-gu, Seoul, Korea, do hereby solemnly and sincerely declare as follows:

1. That I am well acquainted with the English and Korean languages.

2. That the following is a correct translation into English of the accompanying certified copy of a Korean Patent Application No. 10-2003-0014393, and I make the solemn declaration conscientiously believing the same to be true.

Minjung Kwak
July 3, 2006
Seoul, Korea

[DOCUMENT] Application for Patent

[RIGHT] Patent

[TO] The commissioner

[SUBMISSION DATE] February 28, 2003

[TITLE OF THE INVENTION-KOREAN] 잉크젯프린터의 서비스스테이션

[TITLE OF THE INVENTION-ENGLISH] SERVICE STATION FOR INKJET PRINT

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[EXAMINATION REQUEST] YES

[PURPOSE] I, hereby, submit the present application for the Patent and request the examination of the present invention under the Article 42 and the Article 60 of the Patent Law.

Attorney Hong-sik JEONG (seal)

[Official Fee]

[Basic fee]	20	pages	₩29,000
[Additional fee]	7	pages	₩7,000
[Claiming Priority Right]	0	case	₩0
[Filing Request For Examination]	6	claims	₩301,000
[Total]			₩337,000

[Documents] 1. One copy of Abstract, Specification (& drawings)

[ABSTRACT OF THE DISCLOSURE]

[Abstract]

A service station system for an inkjet printer is disclosed. The service station system comprises head caps revolving between a capping position and an uncapping position of printer heads, a slider sliding with respect to the head caps and having wipers mounted on the front end portion thereof, a slider movement unit for sliding the slider, a revolution unit disposed between the head caps and the slider, and for revolving the head caps in association with the sliding of the slider with respect to the head caps. Accordingly, services for the printer heads can be systematically carried out in a relatively small space, and, in particular, a compact and small-sized service station system is provided so that the volume from front to rear of an inkjet printer can be reduced.

[The main figure]

FIG. 3

[Search term]

inkjet printer, service station, capping, wiping, spitting, print head, head cap, revolution unit, slider

[SPECIFICATION]

[The title of the invention]

SERVICE STATION FOR INKJET PRINT

[The brief description of the drawings]

Fig. 1a and Fig. 1b are views for schematically explaining operations of a conventional service station system for an inkjet printer;

Fig. 2 is a partially cut-off perspective view of an inkjet printer in which a service station system according to an embodiment of the present invention is mounted;

Fig. 3 is a partially enlarged perspective view of Fig. 2, showing the service station system;

Fig. 4 is an enlarged view of main parts of Fig. 3, showing in more detail a structure of the service station system;

Fig. 5 is a view taken along lines V-V of Fig. 4;

Fig. 6 is a side view of Fig. 4, showing a state that a nozzle face of a printer head is capped with a head cap; and

Fig. 7 to Fig. 9 are operation state views for explaining operations of the service station system for an inkjet printer.

Description of the reference numerals in the drawings

1: inkjet printer	3:exterior case
11, 12: cartridge	13: print head
17: carrier	20: service station
21: casing	31: head cap
41: head cap revolution unit	43: shaft
45: revolving member	48: second hinge shaft
51: wiper	55: spittoon
61: slider	68: first hinge shaft

71: link 73: hinge bar

75: moving hinge part 76: second hinge hole

77: driving hinge part 78: first hinge hole

81: slider movement unit 83: pinion

85: rack 91: compression coil spring

93: guide bar 97: fixed rib

[Detailed description of the invention]

[Object of the invention]

[The field of the invention and the related art]

The present invention relates to an inkjet printer, and more particularly to a service station system for an inkjet printer capable of maintaining the nozzle surface of a printer head in a good state.

In the outer case of an inkjet printer is generally mounted a service station system washing, protecting, and maintaining a printer head nozzle surface in a good state. Fig. 1a and Fig. 1b are views for schematically explaining operations of a conventional service station system. As can be seen in Figs. 1a and 1b, a conventional service station 100 is provided with a pallet 113 disposed underneath the printer head 13 and movable in a horizontal direction, and a pinion 115 and a rack 117 which moves the pallet 113. The pinion 115 rotates forward and reverse by a motor not shown.

Diverse service parts are mounted on the pallet 113, such as a head cap 121, a wiper 131, and a spittoon 141. The head cap 121 is supported by an elevating member 123 and disposed on the upper front end portion of the pallet 113. Plural link members 127 parallel with each other in a vertical direction and a spring 129 are inserted between the elevating member 123 and the pallet 113. By the link members 127 and the spring 129, the elevating member 123 can ascend and descend in one body with the head cap 121 with respect to the pallet 113. An arm 125 extended in a stand-up direction is installed on the front end of the elevating member 123.

The spittoon 141 is constructed with a spitting hole 143 recessed in the upper surface

of the pallet 113 and a porous absorber 145 accommodated in the spitting hole 143. And the wiper 131 is installed in a stand-up direction on the upper surface of the pallet 113 between the head cap 121 and the spittoon 141. Further, on the rear side of the spittoon 141 is installed a blade 151 fixedly coupled to an additional support device 153 and capable of contacting with the upper surface of the pallet 113. The blade 151, as described later, sweeps into a collector 157 through a drain hole 155 foreign materials and residual ink on the surface of the porous absorber 145 after spitted from the printer head 13.

The conventional service station system 100 for an inkjet printer having a structure as above starts its operations when the printer head 13 is fixedly placed over the assembly 100 after the printing job is interrupted or stopped. If the printer head 13, as can be seen in Fig. 1, is fixedly positioned over the service station system 100, the motor rotates the pinion 115 clockwise to retreat the pallet 113 with respect to the printer head 13. When the pallet 113 retreats, the wiper 131 removes residual ink and foreign materials while contacting with the nozzle face of the printer head 13.

In the meantime, if the retreat of the pallet 113 is nearly completed, the arm 125 of the elevating member 123 comes in contact with the printer head 13. At this time, the pallet 113 continues to retreat, but the elevating member 123 stops moving by the arm 125 stuck on the printer head 13, and the elevating member 123 ascends by the plural link members 127 accordingly.

If the elevating member 123 ascends, the head cap 121 also ascends in one body with the member 123. The ascending head cap 121 gradually seals the nozzle face of the printer head 13, and, thereafter, if the nozzle face of the printer head 13 is completely sealed, the pinion 115 stops its clockwise rotation. In here, the sealing state of the printer head 13 by the head cap 121 continues until a subsequent printing command is inputted.

In the meantime, if the printing command is inputted, the pinion 115 rotates counterclockwise by the motor before the printer head 13 moves to a printing position. With the rotations of the pinion 115, the pallet 113 moves forward, the elevating member 123 descends, and, at the same time, the printer head 13 is being uncapped. Next, the nozzle face of the printer head 13 is wiped by the wiper 131 of the pallet 113 keeping moving forward.

Thereafter, if the printer head 13 moving forward is positioned over the spittoon 141, the pinion 115 stops rotating counter-clockwise. Subsequently, during the interruption or

stop of the printing job, a spitting job is carried out to remove ink or foreign materials firmly stuck on the nozzle face of the printer head 13. In here, after spitting, residual ink stuff on the upper surface of the porous absorber 145 is swept by the blade 151 when the pallet 113 moves. Next, the printer head 13 moves to perform the printing job according to the input command.

However, the conventional service station system 100 for an inkjet printer has a problem that its volume inevitably becomes large since enough space must be secured in order for the pallet 113 to reciprocate. That is, the conventional service station system 100 has to have enough space therein for the movements of the pallet 113 since capping or uncapping, wiping, sweeping, and spitting sequentially progress on the same line the pallet 113 moves in order to maintain the printer head in a good state. Such a problem is particularly dominant on a service station system having the pallet 113 which services on the nozzle face while moving in a direction perpendicular to a printing direction of the printer head 13, which becomes a factor increasing the volume of an inkjet printer in front and rear sides in the long run.

[Technical object of the invention]

Accordingly, in consideration of such a conventional problem, an object of the present invention is to provide a compact and small-sized service station system for an inkjet printer capable of capping or uncapping, wiping, and spitting in a systematic and harmonious fashion in a less space.

It is another object of the present invention to set up a compact and small-sized service station system in an inkjet printer, to thereby decrease in volume from front to rear of the inkjet printer all to nothing.

[Construction and operation of the invention]

In order to achieve the above objects, a service station system for an inkjet printer according to the present invention comprises head caps revolving between capping position and uncapping position of printer heads, a slider sliding with respect to the head caps and having wipers mounted on the front end portion thereof, a slider movement unit for sliding the slider, a revolution unit disposed between the head caps and the slider, and for revolving

the head caps in association with the sliding of the slider with respect to the head caps.

In here, the revolution unit includes a shaft disposed under the printer heads in a traverse direction with respect to the sliding direction of the slider; an revolving member revolving on the shaft, and being coupled with the head caps thereon; and links each hingedly coupled to the revolving member and the slider, and for revolving the revolving member while interlocking with the slider, to thereby have a simple structure.

The links each include a body; a driving hinge part having a first hinge hole on one end portion thereof to be engaged with a first hinge shaft of the slider, and a moving hinge part having a second hinge hole disposed lower than the first hinge hole on the other end portion thereof to be engaged with a second hinge shaft of the revolving member, to thereby have a simple structure.

The body preferably revolves the revolving member upward and downward on the shaft while revolving on the first hinge shaft of the slider, a guide guiding the revolving of the body is preferably disposed between the slider and the revolving member, and the second hinge hole of the moving hinge part is in the form of a long opening lengthened in the direction of the body.

The service station system further preferably includes a spring for restoring the revolving member to the capping position, one end of the spring being fixed to the revolving member, and the other end of the spring being fixed to a rear side spaced in a certain interval from the revolving member.

The slider movement unit preferably includes a rack provided on the upper surface of the slider along a sliding direction, a pinion disposed over the slider and meshed with the rack, and a motor for rotating the pinion, to thereby have a simple structure.

Hereinafter, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. In here, like structure and names are referred to as like reference numerals in connection with Fig. 1 for a prior art.

Fig. 2 is a partially cut-off perspective view for showing an inkjet printer in which a service station system according to an embodiment of the present invention is mounted. An inkjet printer 1 is, as can be seen in Fig. 2, provided with an exterior case 3 in which a printing unit 10 and a service station system 20 is mounted, and a paper cassette 5 detachably coupled to the exterior case 3. The paper cassette 5 includes a supply tray 9 in which plural sheets of paper are loaded and a discharge tray 7 holding printed sheets. Sheets supplied

from the supply tray 9 are printed through the printing unit 10 and fed into the discharge tray 7.

The printing unit 10 is mainly constructed with a guide rail 15 fixed traverse with respect to a sheet feeding direction, a carrier 17 capable of reciprocating along the guide rail 15, and a pair of monochrome and color cartridges 11 and 12 exchangeably coupled to the carrier 17. In here, the carrier 17 can reciprocate by a pulley and a timing belt which rotate by a feeding motor not shown. Such a carrier 17 moves to and waits at one side of the guide rail 15 in case that a printing job of the printer is interrupted or stopped.

In the meantime, the monochrome and color cartridges 11 and 12 are respectively coupled on the left and right sides of the carrier 17. The carrier 17 exposes the nozzle faces of the printer heads 13 of the respective cartridges 11 and 12 through a lower side thereof. Accordingly, the head caps 31 of the service station system 20 to be described later in detail can approach on the exposed nozzle faces of the printer heads 13 from a lower position.

Fig. 3 is a perspective view for showing a service station system for an inkjet printer according to an embodiment of the present invention. The service station system 20 is provided with a nearly cube-shaped casing 21 as can be seen in Fig. 4. An entrance 23 opened for the head caps 31 is formed on the upper surface of the casing 21, and, if the carrier waits over the upper surface, the entrance 23 faces the printer head 13. Such a casing 21 of the service station system 20 is disposed in parallel with a sheet feeding direction. In other words, the casing 21 is provided in a direction perpendicular to a printing direction of the carrier 17 and the printer head 13 of the cartridges 11 and 12 coupled with the carrier 17.

In the meantime, Fig. 4 is a partially enlarged view of such a service station system, showing in more detail main parts mounted in the casing. Referring to Fig. 5, the service station system 20 includes the head caps 31 for capping the printer heads 13, a slider 61 having wipers 51 for wiping the printer heads 13 and spittoons 55 for spitting mounted therein, a slider movement unit 81 for reciprocatably sliding the slider 61, and a revolution unit 41 for converting the sliding of the slider 61 into the up-and-down revolving of the head caps 31.

The revolution unit 41 is constructed with a revolving member 45 with which the head caps 31 are coupled, a shaft 43 for coupling the revolving member 45 to be upward and downward movable in the casing 21, and the links 71 connecting the revolving member 45 and the slider 61. Both ends of the shaft 43 are rotatably coupled on the walls 25 of both

sides of the casing 21, respectively. Such a shaft 43 is preferably mounted in front of the entrance 23 provided on the casing 21.

The revolving member 45 can be sectioned into a plate 44 on which a pair of head caps 31 is mounted and a connecting portion 46 provided on the front end of the plate 44. The connecting portion 46 can be simply constructed with a pair of ribs 49 forward protruded from both front ends of the plate 44 and disposed opposite to each other. The ribs 49 each have a shaft opening, so the revolving member 45 is coupled with the shaft 43 connected on the both side walls 25 of the casing 21. Accordingly, the revolving member 45 can revolve upward and downward on the shaft 43, and, at this time, the plate 44 goes forth and withdraws from the surface of the entrance 23.

In here, the revolving member 45 constructed with the plate 44 and the connecting portion 46 including the pair of ribs 49 can be simply injection-molded in one body. Further, this embodiment has the shaft 43 separated from the revolving member 45, but the parts 43 and 45 can be formed in one body. That is, instead of forming shaft openings in the respective ribs 49, the shafts can be protruded outward from the respective ribs 49 and rotatably coupled on the both side walls 25 of the casing 21.

On the upper surface of the plate 44 is installed on the pair of head caps 31 capable of capping the printer head 13 of the monochrome cartridge 11 and the printer head 13 of the color cartridge 12 respectively. In here, general descriptions on the substance and structure of the head caps 31 and the connection structure of the plate 44 and the head caps 31 are omitted. On the upper surface of the plate 44 is provided a rib 42 partitioning space for mounting the head caps 31 from side to side, and plural ribs 47 for reinforcing strength.

Accordingly, the head caps 31 revolve between an external exposure position through the entrance 23 of the casing 21 and a shield position, moving with the revolving member 45 revolving upward and downward. In here, the head caps 31 exposed through the entrance 23 of the casing 21 cap the nozzle face of the printer heads 13, and the head caps 31 at the shield position uncap the nozzle face of the printer heads 31. Meanwhile, descriptions on the links 71 for revolving the head caps 31 as above will be made later in connection with descriptions on the slider 61 below.

The slider 61 has nearly a rectangular plate shape, and is provided with a wiper connecting portion 63 to which the wipers 51 are coupled and a spittoon connecting portion 65 to which the spittoons 55 are installed. On the both interior walls of the casing 21 is

formed sliding grooves slidably accommodating both sliding sides 62 of the slider 61 respectively. These sliding grooves are opposite to each other in parallel in a horizontal direction, and extended along a lengthened direction between a front wall 27 and a rear wall of the casing 21.

The wiper connecting portion 63 can be simply structured, including a pair of slits 64 on the left and right which are recessed along the front side of the slider 61. Each of the slits 64 is preferably provided to match with the printer heads 13 of the respective cartridges 11 and 12, and the wipers 51 of elastic substance are fixedly coupled to the slits 64 respectively. In here, descriptions on the substance and structure of the wipers 51 will be omitted since they are well known to those skilled in the art.

The spittoon connecting portion 65 is provided with a pair of spitting holes 66 on the left and right sides of the slider 61. The spitting holes 66 are preferably provided to match with the respective slits 64 of the wiper connecting portion 63. Further, the spittoons 55 are coupled in the spitting holes 66 respectively, and slide in one body with the slider 61. The porous absorber (reference number 145 in Fig. 1) is mounted in the spittoons 55, respectively, so that liquid ink can be absorbed which is spitted from the nozzles of the printer heads 13.

In the meantime, the links 71 connecting the slider 61 and the revolving member 45 each include a driving hinge part 77 and a moving hinge part 75 provided on both ends of a body 73. An step part 74 is provided between the moving hinge part 75 and the body 73, which is inclined downward the moving hinge part 75. The body 73, the driving hinge part 77, and the moving hinge part 75 can be simply injection-molded in one body.

Hinge holes 78 and 76 are formed in the horizontal direction in the driving hinge part 77 and the moving hinge part 75, respectively. In here, due to a structure of the moving hinge part 75, the first hinge hole 78 formed in the driving hinge part 77 is disposed at a higher position than the second hinge hole 76 formed in the moving hinge part 75. And the second hinge hole 76 of the moving hinge part 75 is in the form of an extended hole in a lengthened direction of the link 76.

The first hinge hole 78 is rotatably coupled to the first hinge shaft 68 protruded on one side of the slider 61, and the second hinge hole 76 is rotatably coupled to the second hinge shaft 48 protruded on one side of the revolving member 45. In here, the second hinge shaft 48 is preferably provided at a lower position than the first hinge shaft 68 in the state that the slider 61 and the revolving member 45 are disposed in parallel.

The structures of the hinge shafts 48 and 68 and the hinge holes 76 and 78 have an advantage in revolving the revolving member 45 upward and downward with respect to the nozzle faces of the printer heads 13. That is, if the slider 61 approaches the revolving member 45, the links 71 revolve on the first hinge shaft 68 of the slider 61 so as to revolve the revolving member 45 on the shaft 43. At this time, the revolution of the links 71 are guided by the guide 93 (refer to Fig. 7) protruded from the bottom of the casing 21 between the revolving member 45 and the slider 61.

In here, the upper end portion of the guide 93 contacting with the links 71 is bent. Meanwhile, the links 71, that is, the bottom surface of the stepped part 74 contacting with the bent upper end portion 95 of the guide 75, are also bent. The bent portions 79 and 95 smoothly guide the upward and downward revolutions of the revolving member 45 while contacting with each other as the links 71 revolve. The smooth upward and downward revolutions of the revolving member 45 are also promoted by a compression coil spring 91.

The compression coil spring 91, as can be seen in more detail in Fig. 6, has one end coupled to a central area of the rear side of the revolving member 45 and the other end coupled to a fixed rib 97 protruded upward from the bottom surface of the casing 21. The fixed rib 97 and the guide 93 are spaced in a certain interval. The compression coil spring 91 has an elastic restoration force when the member 45 uncapping revolution and prevents the members from the excessive capping revolution.

In the meantime, the slider movement unit 81 is constructed with a rack 85 mounted on the upper side of the slider 61, a pinion 83 rotatably installed at a fixed position over the slider 61 and meshed with the rack 85, and a motor (not shown) for rotating the pinion 83. In here, a gear 88 and a rotation shaft 87 may be further included to transfer a driving force of the motor to the pinion 83. The motor can be installed outside the casing 21. In such a case, the gear 88 coupled on one end of the rotation shaft 87 externally exposed through the casing 21 is meshed with plural gears (not shown) connected with the motor, so the driving force of the motor can be transferred to the pinion 83.

The service station system 20 for an inkjet printer having the above structure performs wiping and capping operations after a printing job is interrupted and stopped and the carrier 17 stays at a waiting position, that is, at an upper position of the casing 21. Further, before the carrier 17 moves for the printing job according to a printing start command, the service station system 20 implements uncapping, wiping, and spitting in order.

Hereinafter, the operations of the service station system are described in detail with reference to Fig. 7 to Fig. 10.

Fig. 6 is a side view of Fig. 4, showing a state that the nozzle face of a printer head is capped with the head cap 31. In Fig. 6, the carrier 17 is placed at the waiting position before the printing command is inputted, and, at this time, the printer head 13 is maintained capped. The capping can seal and protect the nozzle of the printer head 13 from external pollutants or dry atmosphere. In such a state, the compression coil spring 91 is also expanded so that a restoration force is applied in a direction of moving the revolving member 45 downward.

In the meantime, if the printing command is inputted, the pinion 83 rotates clockwise to move the slider 61 toward the revolving member 45. Accordingly, the link 71 moves forward, so the second hinge shaft 48 of the revolving member 45 relatively moves toward the slider 61 along the second hinge hole 76 formed of the extended hole in the moving hinge part 75 of the link 71. At this time, if the second hinge shaft 48 can not move any further, the link 71 starts downward revolution on the first hinge shaft 68. In here, the revolving member 45 associated with the link 71 also revolves downward on the shaft 43. Then the head cap 31 capping the printer head 13 revolves downward in one body with the revolving member 45, so the capping state is released.

Fig. 7 shows a state that the head cap 31 revolving in one body with the revolving member 45 gradually opens the printer head 13. In here, the link 71 is guided to revolve down by the guide bar 93 and the compression coil spring 91. Thereafter, the slider 61 keeps moving forward, so the link 71 becomes spaced from the guide 93 in the long run, as can be seen in Fig. 9. At this time, the wiper 51 coupled to the slider 61 wipes the nozzle face of the printer head 13 clean.

Even after the cleaning, the slider 61 continues to move forward, and Fig. 9 is a view for showing a state that the forward and reverse rotations of the pinion 83 are stopped and the printer head 13 is completely uncapped. Referring to Fig. 9, in a state that the printer head 13 is completely uncapped, the spittoon connecting portion 65 is placed vertically under the printer head 13. Then the printer head 13 carries out the spitting for removing ink and foreign materials firmly stuck on the nozzle face thereof. If the spitting is completed, the carrier 17 moves the cartridges 11 and 13 to the printing position for the printing job.

In the meantime, if the carrier 17 stays at the print waiting position, that is, the carrier 17 moves over the service station system 20 so its position is fixed, after the printing job

interrupted or stopped, the pinion 83 starts rotating counterclockwise. Then the wiping and capping are implemented in the reverse of the order aforementioned, which are a series of maintenance jobs for wiping and protecting the printer head 13.

Further, even through not described in the service station system 20 of the embodiments stated and shown above, the upper side of the slider 61 is preferably provided with the drain hole 155 and the blade 151 as described in connection with Fig. 1 for prior art. Then the blade 151 can remove foreign materials remaining on the porous absorber 143 after spitting is done.

[Effect of the invention]

As aforementioned, the present invention can reduce work space for washing and protecting the printer heads since the revolving member on which head caps are mounted revolves in the sliding space for a slider on which wipers and spittoons are mounted, to thereby provide a small-sized and compact service station system for an inkjet printer.

Further, with adoptions of the small-sized and compact service station system according to the present invention, an excellent effect can be provided that can greatly reduce the volume of an inkjet printer from front to rear.

[What is claimed is]

1. A service station system for an inkjet printer, comprising:

head caps revolving between a capping position and an uncapping position of printer heads;

a slider sliding with respect to the head caps, and having wipers mounted on the front end portion thereof;

a slider movement unit for sliding the slider;

a revolution unit disposed between the head caps and the slider, and for revolving the head caps in association with the sliding of the slider with respect to the head caps.

2. The service station system as claimed in claim 1, wherein the revolution unit includes:

a shaft disposed under the printer heads in a traverse direction with respect to the

sliding direction of the slider;

a revolving member revolving on the shaft and being coupled with the head caps thereon; and

links each hingedly coupled to the revolving member and the slider, and for actuating the revolving member while interlocking with the slider.

3. The service station system as claimed in claim 2, wherein the links each include:

a body;

a driving hinge part having a first hinge hole on one end portion thereof to be engaged with a first hinge shaft of the slider; and

a moving hinge part having a second hinge hole disposed lower than the first hinge hole on the other end portion thereof to be engaged with a second hinge shaft of the revolving member.

4. The service station system as claimed in claim 3, wherein the body revolves the revolving member upward and downward on the shaft while revolving on the first hinge shaft of the slider, a guide guiding the revolving of the body is disposed between the slider and the revolving member, and the second hinge hole of the moving hinge part is in the form of a long opening lengthened in the direction of the body.

5. The service station system as claimed in one of claims 2 through 4, further comprising a spring for restoring the revolving member to the capping position, one end of the spring being fixed to the revolving member, and the other end of the spring being fixed to a rear side spaced in a certain interval from the revolving member.

6. The service station system as claimed in claim 1, wherein the slider movement unit includes:

a rack provided on the upper surface of the slider along a sliding direction;

a pinion disposed over the slider and meshed with the rack; and

a motor for rotating the pinion.